

| PAYLOAD HAZARD REPORT  |  | a. NO: GHR AMS02--006   |
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| b. PAYLOAD: Alpha Magnetic Spectrometer-02 (AMS-02) GSE<br>Alpha Magnetic Spectrometer-02 (AMS-02) GSE   |  | c. PHASE: II  |
| d. SUBSYSTEM:<br>CGSE, Flight Cryogenic System   | e. HAZARD GROUP:<br>Touch Temperatures | f. DATE:<br>May 2008  |
| g. HAZARD TITLE:<br>Injury to Personnel due to Excessively Low Temperatures.   |  | i. HAZARD CATEGORY<br><input checked="" type="checkbox"/> CATASTROPHIC<br><input type="checkbox"/> CRITICAL |
| h. APPLICABLE SAFETY REQUIREMENTS:<br><br>KHB 1700.7, Section: 4.2.1.5 Temperature   |  |   |
| j. DESCRIPTION OF HAZARD:<br>Excessively low temperatures present touch temperature hazards to ground personnel. (Below 0°C or 32°F)   |  |   |
| k. HAZARD CAUSES:<br>1. Inadequate insulation of cryogen systems.<br>2. Release of cryogenic material.<br>3. Accumulation of ice/liquefaction of air on cryogenic equipment. |  |   |
| l. HAZARD CONTROLS:<br><br>(See continuation sheet)  |  |   |
| m. SAFETY VERIFICATION METHODS:<br><br>(See continuation sheet)  |  |   |
| n. STATUS OF VERIFICATION:<br><br>(See continuation sheet)   |  |   |
| o. APPROVAL  | PAYLOAD ORGANIZATION                   | SSP/ISS   |
| PHASE I  |  |   |
| PHASE II   | <i>JM</i> TRENT MARTIN 10/3/08         | <i>Paul R. Helt</i> 10/3/08   |
| PHASE III  |  |   |

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| <b>PAYLOAD HAZARD REPORT CONTINUATION SHEET</b>   |  | a. NO: GHR AMS02--006 |
| b. PAYLOAD: Alpha Magnetic Spectrometer-02 (AMS-02) GSE   |  | May 2008 PHASE:II     |
| k. HAZARD CAUSES:<br>1 Inadequate insulation of cryogen systems.  |  |                       |
| l. HAZARD CONTROLS:<br>1.1 Proper design of cryogen systems. Plumbing has either vacuum insulation or high R value insulation to preclude excessively cold contact potential.<br>1.2 Keep-out zones will be marked for those areas that exceed touch temperature limits.<br>1.3 PPE to be used by personnel who are working with cryogenic systems. |  |                       |
| m. SAFETY VERIFICATION METHODS:<br>1.1.1 Review of design.<br>1.1.2 Inspection of as built hardware<br>1.1.3 Thermal analysis of touch temperatures at external surfaces of dewars and plumbing.<br>1.2.1 Inspection of AMS-02 and GSE for proper labeling of keep-out zones.<br>1.3.1 Review of procedures to ensure personnel are issued PPE.     |  |                       |
| n. STATUS OF VERIFICATION:<br>1.1.1 Open<br>1.1.2 Open<br>1.1.3 Open<br>1.2.1 Open<br>1.3.1 Open  |  |                       |

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| k. HAZARD CAUSES:<br>2. Release of cryogenic material.  |  |                       |
| 1. HAZARD CONTROLS:<br>2.1 The SFHe vents are positioned to preclude impingement of very cold gases upon critical structures, systems, and work areas.<br>2.2 Cryogenic systems will be monitored by trained personnel via flight and ground monitoring equipment to identify any leaks or other cryogenic system fault and apply appropriate corrective procedures.  |  |                       |
| m. SAFETY VERIFICATION METHODS:<br>2.1.1 Review of design.<br>2.1.2 Inspection of as built hardware.<br>2.1.3 Venting analysis.<br>2.1.4 Thermal analysis.<br>2.1.5 Keep-out zones posted around vent areas.<br>2.1.6 CGSE will include clear and obvious indications of which portions of the flight hardware and GSE contain cryogenic fluids.<br>2.2.1 Verification of training of those personnel handling cryogenic systems. |  |                       |
| n. STATUS OF VERIFICATION:<br>2.1.1 Open<br>2.1.2 Open<br>2.1.3 Open<br>2.1.4 Open<br>2.1.5 Open<br>2.1.6 Open<br>2.2.1 Open  |  |                       |

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| k. HAZARD CAUSES:<br>3. Accumulation of ice/liquefaction of air on cryogenic equipment.   |  |                      |
| 1. HAZARD CONTROLS:<br>3.1 Proper insulation of cryogenic system to preclude accumulation of ice.<br>3.2 If insulation has been found to be inadequate in specific areas where the potential for air liquefaction is possible, "diapers" or "catch pans", as appropriate, will be used to preclude excessive cold contact with neighboring systems and structures.<br>3.3 Use of localized heaters (i.e. warm air blowers) to preclude formation of ice.<br>3.4 Warning signs will be placed on those areas where ice might accumulate. |  |                      |
| m. SAFETY VERIFICATION METHODS:<br>3.1.1 Review of design.<br>3.2.1 Preflight thermal analysis.<br>3.2.2 Review of design.<br>3.2.3 Inspection of installed "diapers" and "catch pans".<br>3.3.1 Review of AMS procedures to ensure placement of heaters.<br>3.4.1 Review of AMS procedures to ensure placement of warning signs.   |  |                      |
| n. STATUS OF VERIFICATION:<br>3.1.1 Open<br>3.2.1 Open<br>3.2.2 Open<br>3.2.3 Open<br>3.3.1 Open<br>3.4.1 Open  |  |                      |